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REPORT OF THE HYDROGRAPHIC COMMISSION OF PERU ON THE AMAZON RIVER.

Iquitos, Peru, *December* 16, 1873.

The steamers *Mairo* and *Tambo* for exploring purposes being placed under the orders of the commissioners, along with the first assistant, Mr. J. H. Rocheile; the surgeon, Francis L. Galt; the engineer, J. W. Sparrow, and the secretary, L. M. Mesnier, we embarked on board of the *Tambo*, with the chronometer and other instruments.

The second assistant, Mr. W. R. Butt, and the civil engineer, Nelson B. Noland, went on board of the *Mairo* with the instruments necessary for the task intrusted to them. On the seventeenth of September the steamer *Mairo* left with the object of exploring the River Nanay. On the following day the *Tambo* left her anchorage at Iquitos and proceeded down the Amazon for the purpose of commencing the duties of the commission along the frontiers of Brazil.

On the twenty-seventh of the same month we arrived at the mouth of the River Yavari and remained there some days to determine with greater exactness its position by astronomical observation. The River Yavari has three mouths, of which the lower was fixed upon as being the most important, and great care was taken to determine its position correctly.

On the twenty-ninth of September the *Tambo* left this point, and ascending the River Amazon, we arrived at Iquitos on the twelfth of December, having determined various points on the way by astronomical and other observations. We found the *Mairo* at anchor at Iquitos, having returned on the second of October from an exploration of the River Nanay. On the twenty-seventh of October the *Mairo* left Iquitos to explore the Rivers Morona, Potro, Pastaza and Tigre. From the twenty-eighth of October to the twentieth of November the *Tambo* continued navigating in the river, stopping at the important points to determine their several positions. On November 20th the *Tambo* arrived at an obstacle or *mal paso*, a little above Punta Achual, as far as which the river can be navigated without danger. As the navigation of the Amazon, above Punta Achual, is always difficult, especially for merchant vessels, it would be better, if a road is opened up into the Alto Amazon, to let it terminate at a point on the river before reaching Punta Achual.

It would be necessary to have a topographic plan constructed to determine which point was best, bearing also in mind that the road should terminate at a point not liable to be affected by inundations of the river, as well as offering easy access to merchant vessels; some point near Barranca would be the most suitable. The banks of the Maranon are generally low and exposed to be overflowed at the time of the annual rises of the river. On the twenty-second of November, the *Tambo* left Punta Achual, descended the Amazon to the mouth of the River Huallaga, and commenced the ascent of it on the twenty-fourth. The ascent occupied five days, stopping at Yurimaguas and other points, whose positions were determined. On the twenty-ninth the *Tambo* arrived at Rumi-Callarina, which was considered the terminating point for trading vessels. Its position was laid down with care. It was reported that a road had been begun to this point by the prefect of Loreto, which, it was thought, would not be difficult to accomplish, and would be of great benefit to this part of Peru. The lands on the banks of the Huallagas, from Lagunas Rumi-Callarina, were out of the reach of inundation, and very suitable for plantations. On the sixth of December, both the exploring steamers had returned to Iquitos.

To the above are added tables showing the latitudes, longitudes, distance from Iquitos, and from the mouth of the Yavari river, magnetic variations of the compass, and observation on the currents. The charts of the explorations and the meteorological observations taken by Surgeon Galt, accompanied the report to the government. The following are the tables referred to above:

TABLE OF LATITUDES AND LONGITUDES.

PLACES.	Latitude South.	Longitude West of Greenwich, in degrees.	Longitude West in time.
RIO AMAZON.	° ′ ″	° ′ ″	H. M. S.
Mouth of River Yavari	4 18 45	69 53 10	4 39 32
Letitea	4 10 57	69 49 21	4 39 17
Loreto	3 54 20	70 7 45	4 40 31
Iquitos	3 44 15	73 7 30	4 52 30
Mouth of River Ucayali	4 28 30	73 21 30	4 53 26
Nauta	4 31 30	73 27 0	4 53 48
Santa Cruz de Parinari	4 36 30	74 6 30	4 56 26
Barranca	4 59 53	76 38 38	5 6 34
Punta-Achual	4 15 27	77 1 28	5 8 5
RIO HUALLAGA.			
Yurimaguas	5 51 55	75 59 58	5 3 59
Rumi-Callarina	5 58 32	75 47 32	5 3 10

J. H. ROCHELLE.
T. R. TUCKER.

IQUITOS, *December* 10, 1873.

The report then gives the following table of distances of the entrance to the Yavari river and of Iquitos:

Table of Distances from the Mouth of the Yavari river and from Iquitos.

PLACES.	Distance from the mouth of River Yavari in marine miles.	Distance from Iquitos in marine miles.
Mouth of the Rio Yavari	00	315
Tabatinga (Brazil)	14	301
Letitea	17	298
Loreto	53½	261½
Port of Pebas	198	117½
Tigre	235	80½
Iquitos	315	00
Tamshi-yacu	334½	19½
Mouth of the Ucayali	376¾	61¾
Nauta	383¼	68¼
San Regis	418¾	103¾
Mouth of the Tigre-yacu	434	419
Santa Cruz de Parinari	461½	146½
Vaca Marina	523	208

PLACES.	Distance from the mouth of River Yavari in marine miles.	Distance from Iquitos in marine miles.
Elvira	541	226
San Pedro	557½	242½
Fontevera	597	282
Mouth of the Huallaga	619	304
Mouth of the Pastaza	702½	387½
Cedar island	633½	318½
Barranca	733¾	418¾
Mouth of the Potro	753	438
Mouth of the Morona	765	450
Limon	777	462
Punta-Achual	801	486
RIO HUALLAGA.		
Mouth of the Huallaga	619	304
Laguna	635½	320½
Santa Lucia	661½	346½
Santa Maria	716½	401½
Yurimaguas	742½	427½
Caina-rache	781	466
Rumi-Callarina	788	473

Table of Magnetic Variations and Elevations above the sea.

	Magnetic variation of compas east.			Elevation in meters of river above the level of the sea.	
RIO AMAZON.	°	′	″	M.	MM.
Mouth of the Yavari	5	38	54	81	075
Letitea	5	7	40		
Loreto	5	11	24	87	171
Iquitos	5	56		89	914
Mouth of the Ucayali	7	2	0	96	924
Nauta	7	2		97	534
Santa Cruz de Parinari	7	27	20	106	983
Barranca	7	46	26	138	072
Punta-Achual	8	18	18	155	140
RIO HUALLAGA.					
Yurimaguas	7	47		134	109
Rumi-Callarina	8	8	10	148	130

OBSERVATIONS ON THE CURRENTS.

River Amazon.

Between the mouth of the River Yavari and Tabatinga the current of the River Amazon has a velocity of four and six-tenths miles per hour.

Between Tabatinga and Letitea, three and three-tenths miles per hour.

Between Letitea and Loreto, three miles per hour.

Between Loreto and the port of Pebas, two and a half miles per hour.

Between Tigre and Iquitos, three miles per hour.

Between Iquitos and Tamshi-yacu, three miles per hour.

Between Tamshi-yacu and the mouth of the River Ucayali, the Amazon runs two and one-fourth miles per hour.

Between the mouth of the Ucayali and Nauta, three and one-fourth miles per hour.

Between Nauta and San Regis, three and a half miles per hour.

Between the mouth of the River Tigre-yacu and Santa Cruz de Paninari and Panirani, three and a half miles per hour.

Between Panirani and Vaca-marina, two and three-fourth miles per hour.

Between Vaca-marina and Elvira, two miles per hour.

Between S. Pedro and Fontevera, three and one-eighth miles per hour.

Between Fontevera and mouth of the Huallaga, three miles per hour.

Between the mouth of the Huallaga and Cedar island, three and two-tenths miles per hour.

Between mouth of the Pastaza and Barranca, the current runs three miles per hour.

Between Limon and Punta-Achual, three and three-fourth miles per hour.

River Huallaga.

Between mouth of River Huallaga and Laguna the current of the Huallaga runs two and one-half miles per hour.

Between Santa Lucia and Santa Maria the Huallaga has a velocity of three and one-fourth miles per hour.

Between Yurimaguas and Caina-rache the Huallaga runs three and one-fourth miles per hour.

Between Caina-rache and Rumi-Callarina this river runs three miles per hour.

IQUITOS, *December* 10, 1873.

The Peruvian Exploring Commission, on board of Steam Launch Mario, to President of the Hydraulic Commission of the Amazon.

IQUITOS, *December* 10, 1873.

SIR. — In compliance with your order of the fifteenth of September, ultimo, I embarked on board of the steam launch *Mairo*, along with the other members of the exploring commission, on the seventeenth, and started from Iquitos the same day for the mouth of the River Nanay.

EXPLORATION OF RIVER NANAY.

The unfavorable state of the weather preventing the determination of the astronomical position of this point, I proceeded next day to Lago Semilla and there took in wood. The River Nanay has a different aspect from the Ucayali, the most remarkable circumstance being in the entire absence of the timber called capviona, and in its place the abundance of caoutchouc trees, which produce gum-elastic, or *heve*. In the transit to this place we passed several huts inhabited by individuals occupied in collecting this remarkable gum. On the twenty-first we left Lago Semilla, and in two hours and a half passed the mouth of the River Pinto-yacu, on the right side of the river. There were a large number of Indians collecting turtles on the beach of the river.

The waters of the Pinto-yacu are of a yellow color, and communicate the same tint to the River Nanay, which it preserves far beyond its mouth. The distance of the Pinto-yacu to the mouth of the Nanay is eighty-five miles. Its banks are low and well wooded.

On the twenty-fifth we arrived at the extreme navigable point, distant from Pinto-yacu 105 miles, and from the mouth of the Nanay 195 miles. On the first of October, after making all the observations necessary, we left Pinto-yacu and anchored at the mouth of the Nanay at 10.30 P. M. On the third of October we proceeded toward Iquitos, and arrived there in two hours, against the current.

The Indians that dwell upon the banks of the Nanay belong to the tribe of the Iquitos. They are good looking and well made. They seem to be exempt from the cutaneous diseases that affect the tribes of the Upper Marañon and the Ucayali. They showed themselves friendly to the whites, with whom they trade and hire themselves to aid in the fisheries and agriculture. The banks of the Nanay are high, and the climate good, being free from intermittent fevers and other such diseases.

The River Nanay is formed from the drainage of an immense extent of lowlands, and consequently has the temperature of its waters higher than that of the Amazon, from which circumstance it results that its rivulets and lagoons are literally covered with fish and turtles.

EXPLORATION OF THE RIVER ITAYA.

Having concluded the exploration of the Nanay, we set out from Iquitos on the thirteenth of October, for the River Itaya, and anchored in the port of Ablas (name of a farm), and having taken in wood, proceeded on the seventeenth, but found the navigation difficult in consequence of the great quantity of fallen trees that formed formidable palisades in the course of the river. These at last became so numerous that the exploration had to be given up after we had penetrated thirty-eight miles from the entrance.

This river, like the Nanay, is supplied by the waters from various lakes and lagoons formed at a considerable distance in the interior. The width at the mouth is sixty yards, and the current not strong. Its banks are generally low and become inundated in the winter season. There are very few inhabitants, and those live on small plantations near the entrance.

EXPLORATION OF THE RIVER POTRO.

On October twenty-seventh we left Iquitos in the steam launch *Mairo*, towards the River Potro, one of the affluents of the upper Marañon, and, after eleven days against the current, arrived at the mouth of said river on the eighth of November. Having cut and taken in wood, we began navigation, encountering many difficulties, caused by the innumerable palisades brought down by the current. Persevering, however, until a range of mountains came into view along the horizon, distant about six miles, and about forty-eight miles from the mouth, we came to some rapids, which might have been passed at the risk of upsetting. Deciding this to be the extreme navigable point, the attempt was not made. After the latitude and longitude were taken, we returned and anchored in the mouth of the river. This entrance is about 1,200 yards wide. The lands on both sides are exposed to be inundated by a rise of the river to twenty miles back from the mouth.

The navigation of this river was considered of importance, as a road is now actually being opened from Chachapoyas to its head-waters in order to facilitate communication with the Amazon. The lands about its head-waters are inhabited by savages, who are hostile to the whites and are opposed to the navigation of the river.

From the mouth to the point where the launch arrived no rocky formation could be seen, the head of the river being of white sand. The mean temperature of the air was 85° F., and of the water 72°.

EXPLORATION OF THE RIVER MORONA.

The expedition then proceeded to the exploration of the River Morona, another of the affluents of the Marañon. After having ascended thirteen miles up the Marañon, the entrance to the River Morona was reached. About three hours after leaving the mouth of the latter, that of the small River Amaya was passed on the right bank. It was reported that the banks of this river were inhabited by the Caguapan Indians, who follow the custom of compressing the heads of their victims by some method yet unknown. The banks of this river were found, like those of the Potro, subject to be inundated tò a distance of twenty miles, more or less. On the sixteenth of November the examination was continued; but the current becoming stronger and the palisades increasing in numbers, although this river still had a depth of from three to four fathoms, it was decided as useless to go any further. No signs of natives were seen except an abandoned hut.

EXPLORATION OF THE RIVER PASTAZA.

The examination of the Pastaza was begun on the twentieth November. The width of this river equals that of the Marañon, but its course is full of shoals, which renders it, when its waters are low, impracticable even for canoes. The water rises and falls with great rapidity, and the steam launch got aground very often. It was reported that this river abounded in gold, but that all those who attempted to collect it had fallen victims to the Indians. The bed of the river is of black sand and the banks very low.

EXPLORATION OF THE TIGRE.

This river is wide and deep at all times of the year. From the twenty-fifth to the twenty-eighth were spent in ascending this river. On the twenty-eighth a place was come to where the margins of the stream were high and perpendicular. The banks were composed of alternate strata of yellow, white and red clay. The marks on the trees showed that the river during its last increase had risen sixteen feet. The distance run was 104 miles, and the latitude and longitude were taken of the farthest navigable point.

This river possesses more natural advantages than any other tributary of the Marañon. Caoutchouc, or the *heve* trees, abounded, as well as copaiba, wax, copal, pitch and sarsaparilla. The woods abound in large animals, and the rivulets were full of turtle and fish. On the fourth of December last the steam launch arrived at Iquitos.

Astronomical Positions Determined by the Peruvian Exploring Expedition.

DATES, 1873.	OBSERVED POSITIONS.	Latitude South.	Longitude West of Greenwich.	Longitude in degrees.	Current per hour.
		° ′ ″	H. M. S.	H. M. S.	
September 22....	Mouth of the River Nanay....................	3 38 15	4 52 32	4 52 32	....
24....	Mouth of the Pinto-yacu	....	4 35 20	73° 36 0	....
25....	End of navigation of the Nanay..............	3 43 20	4 56 36	74 9 0	1¾ miles.
October 13....	Mouth of the Haya..........................	5 44 15	4 52 30	73 7 0	1¼ miles.
18....	End of navigation of the above..............	4 10 15	4 53 42	73 25 40	....
November 11....	Mouth of River Potro.......................	4 46 40	5 7 22	76 50 35	2 miles.
12 ...	End of navigation of the above..............	5 18 0	5 8 53	77 13 25	....
15....	Mouth of River Morona......................	4 36 20	5 7 38	76 54 40	2½ miles.
19....	End of navigation of River Morona...........	4 6 0	5 7 40	76 55 3	....
20....	Mouth of the Pastaza.......................	5 6 28	5 5 22	76 20 35	2 miles.
26...	Mouth of the River Tigre	4 26 0	4 55 28	73 52 0	1¼ miles.
29....	End of navigation of the River Tigre.........	3 38 40	5 2 12	75 34 0	....